



ARROYO CENTER

***“Making the Connection:
Beneficial Collaboration Between
Army Installations and Energy Utility
Companies”***

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Motivation for RAND Study

- **Energy Independence and Security Act of 2007, Energy Policy Act of 2005, and Executive Order 13423 require military installations to**
 - Reduce energy use 30% by 2015
 - Increase renewable energy use 7.5% or more by 2013
- **Army installations spend significant amounts on energy utilities**
 - Over \$1.2 billion spent in 2010
 - Energy prices are rising
- **Collaboration with utility companies, such as with Utility Energy Service Contracts (UESCs), offers opportunities for installations to**
 - Save energy
 - Save money
 - Increase investments in renewable energy

Objective and Tasks of RAND Study

- **Objective**

- **Develop recommendations for improving Army installation collaboration with utilities to reduce traditional energy usage**

- **Tasks**

- **Examine current collaboration**
- **Identify problems and barriers to collaboration**
- **Identify and assess options for improving collaboration**
- **Develop recommendations to improve installation and utility collaboration**

Methodology

- **Literature and document review included**
 - Trade press
 - Department of Energy (DOE)
 - OSD, Army, and other Services
- **Installation and utility company visits and phone interviews**
 - Visits: Fort Irwin, Edwards Air Force Base (AFB), Fort Knox, and Fort Lewis, and Southern California Edison (SCE)
 - Phone interviews of other Army and Service installations, including Camp Pendleton, and Forts Stewart, Campbell, Belvoir, Bragg, Carson, Huachuca, and Rucker
- **Interviewed other experts, for example staff at**
 - Installation Management Command (IMCOM)
 - Federal Energy Management Program (FEMP)
- **Attended GovEnergy, FUPWG, and UESC workshops and meetings**

Outline

- **How installations collaborate with utilities**

- Installation examples
- Summary of the collaboration methods and benefits

- **Findings and recommendations**

- Barriers to installations collaborating with utilities
- Recommendations about how best to overcome the barriers

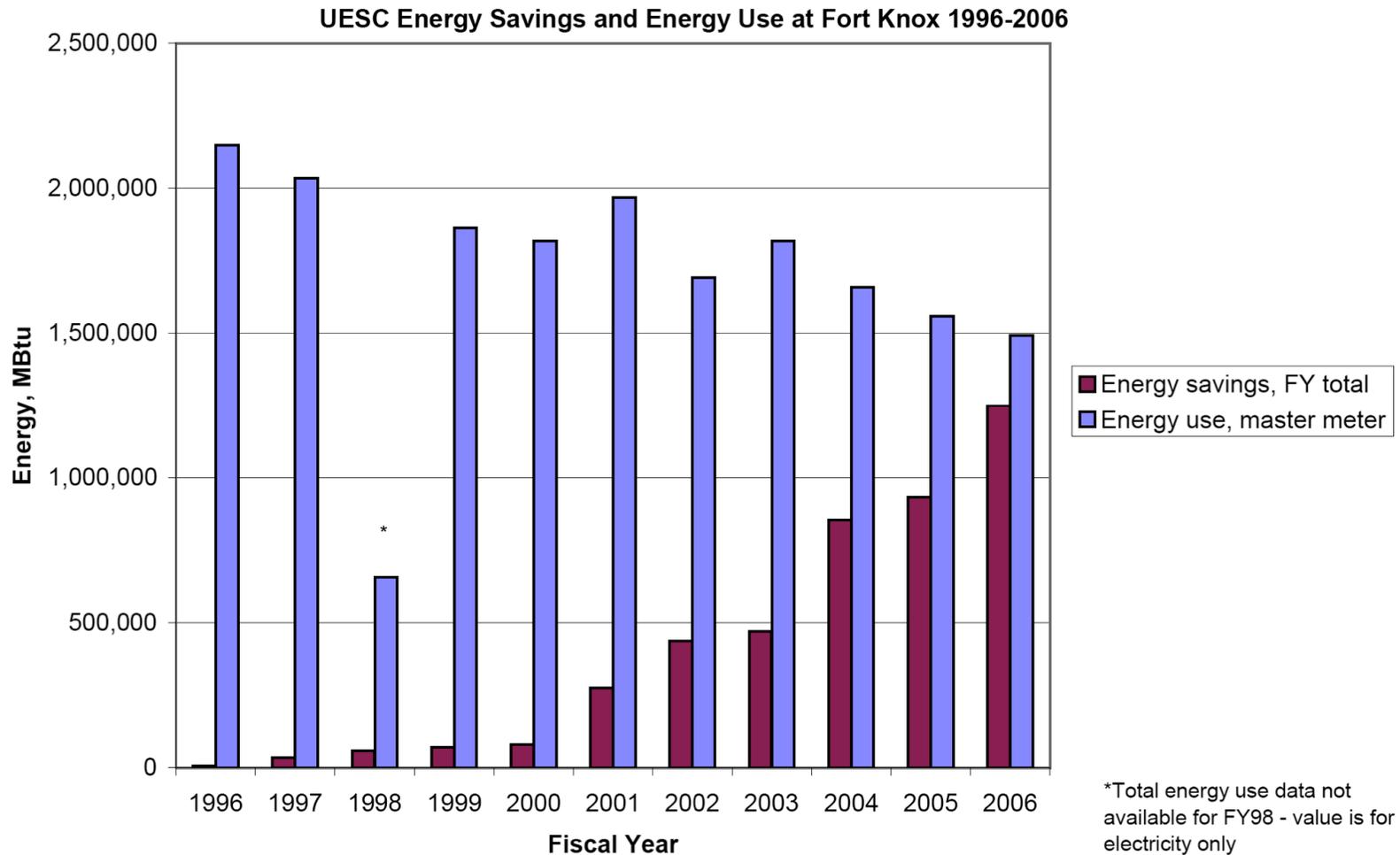
Examples of Utility-Installation Collaboration: Fort Knox UESC projects

- **By fall 2008, 91 UESC projects completed or just being started**
- **70 UESC projects implemented from FY96 to F06**
 - **First projects in 1996 and 1997 mostly lighting projects**
 - **Over time projects became larger and more complex**
 - **Recent examples include: ground source heat pumps (GSHPs), boiler upgrades and replacements, and photovoltaics**
- **Since FY06 over 20 new projects are either being developed or implemented**
 - **As of August 2008: 4.9% financing rate**
 - **Ongoing relationship with the utility, Nolin Rural Electric Cooperative Corporation (RECC) and its contractors has enabled an accelerated pace in**
 - **Developing new task orders**
 - **Implementing and completing projects**

Fort Knox UESC Projects Total Energy Savings

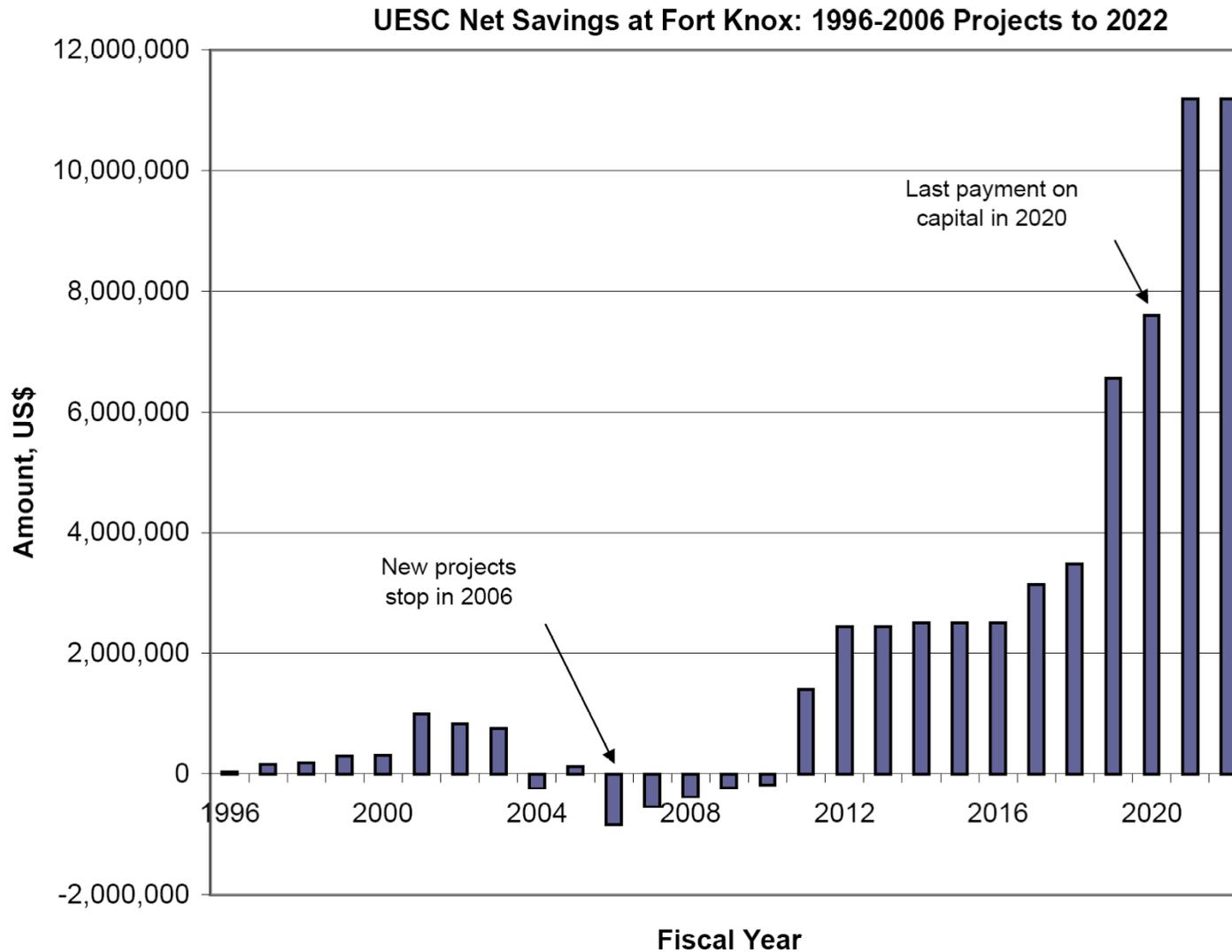
Compared to Total Energy Use (Natural Gas + Electricity)

58% absolute energy reduction between 1996 and 2006



Fort Knox UESC Projects FY Net \$ Savings

Cost Savings (from Energy Savings) - Costs (Payments)



Fort Knox Ground Source Heat Pump (GSHP) Projects

FORT KNOX - GEO THERMAL SYSTEM



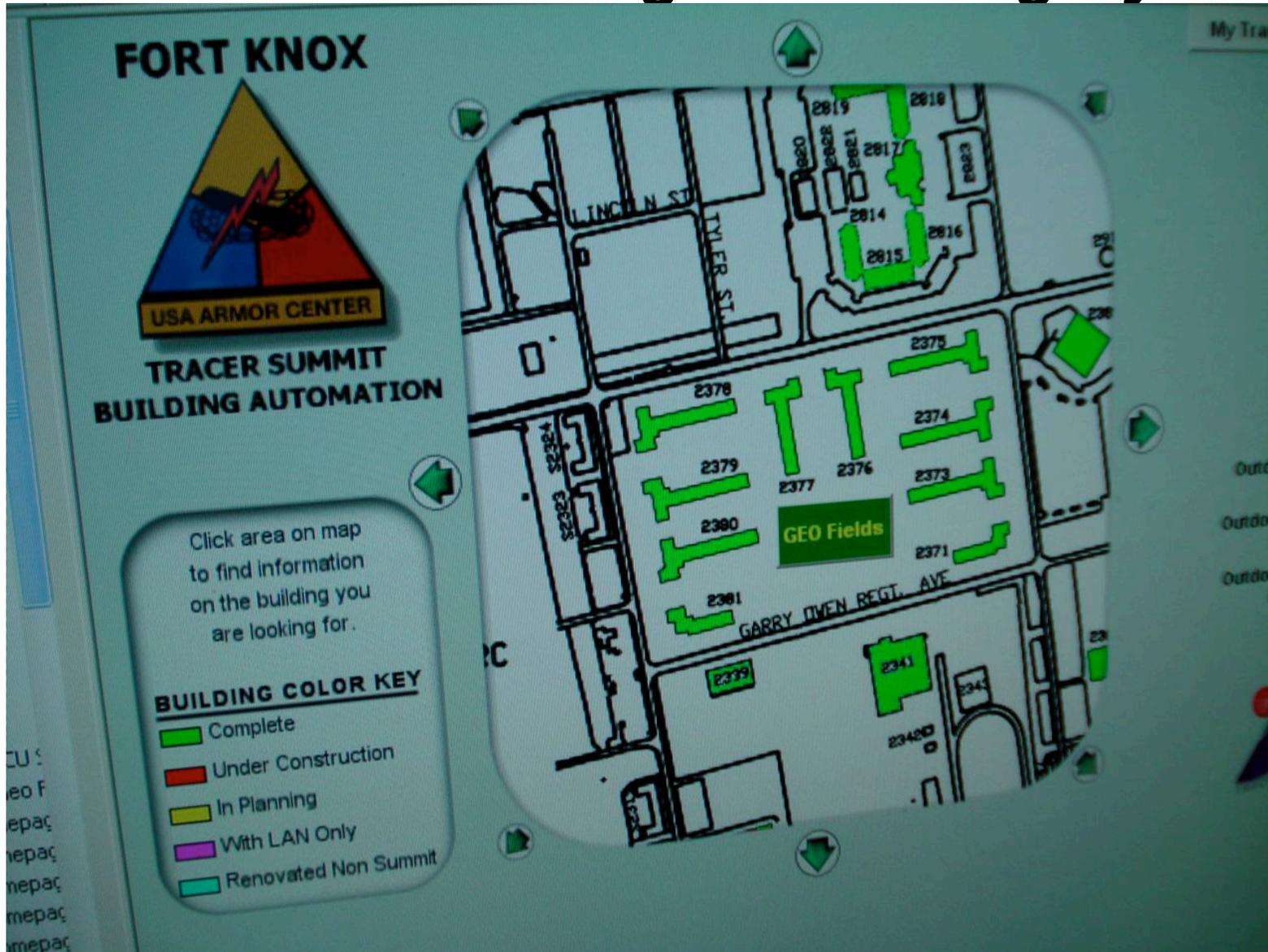
Fort Knox Ground Source Heat Pump (GSHP) Projects

- **GSHPs are systems that provide heating and cooling by taking advantage of 57°F ground temperature**
- **By end of FY06, GSHPs demonstrated**
 - **Significant energy savings**
 - **Increased comfort and reduction in mold in buildings**
 - **Financial payback of about 10 years**
 - **New construction sites can be built without any natural gas for heating and cooling**
 - **About 25% of installation's facilities using GSHPs**
- **By August 2008, about 50% of Fort Knox's total building square footage was heated and cooled by GSHPs**
 - **Over 250 buildings (total of about 5 million square feet)**
 - **About 118 GSHP systems**
- **Expertise and experience key to success**
 - **Proper sizing, installation, and maintenance**
- **Additional GSHPs through ECIPs and by tenants**
- **Developed infrastructure to develop and support GSHPs**

Fort Knox UESC Experience: Strong Monitoring and Maintenance

- **Over time included monitoring and maintenance within the UESC task orders**
 - Installation and on-site monitoring by Harshaw-Trane for most projects
 - Operations and maintenance (O&M) for all equipment that are installed by UESCs for the life of the equipment
- **Sophisticated wireless computerized building monitoring system**
 - Trane Tracer System
 - About 8 million square feet of buildings, about 4/5 of the installation's total
- **O&M built into UESC task orders**
 - “Performance” of equipment and maintenance
 - Work performed via Nolin RECC through Trane contractor
 - Trane has trained and experienced staff on the installation

Trane Tracer Building Monitoring System



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Report at: <http://www.rand.org/pubs/monographs/MG1126.html>

Many Other Energy Projects at Fort Knox Leverage Off of This UESC Experience

- **Implementing UESC for Devonian Shale**
 - Unconventional resource for natural gas which could potentially meet Fort Knox' s natural gas needs with 4 wells
 - Contracting and environmental impact issues delayed this project for 3 years since initial company contact
- **Wind turbine kW-scale pilot project made possible because of UESC savings on other technologies**
- **Many ECIPs have leveraged UESC experience**
 - 12 projects as of August 2008
 - 6 GSHP-related projects
- **Resource Efficiency Manager (REM) paid for by UESC savings**

Fort Campbell UESC Experience

- **Since FY05, Fort Campbell has awarded 6 UESC projects with TVA and Pennyryle Rural Electric Cooperative Corporation for a total annual savings of \$4,232,884, projects included**
 - **Boiler decentralization, saving ~130K MBTUs**
 - **Conversion of HVAC in 1 of 4 similar barracks to GSHP, saving over 21K MBTUs annually**
 - **EMCS implementation, which is now in over 300 buildings**
 - **HVAC, lighting, boilers, and hot water heaters replaced, and EMCS installed in Barracks Triage Program**
- **Key components of Fort Campbell's UESC program**
 - **UESC stakeholder board**
 - **Quality Assurance Evaluator**
 - **Commissioning**
 - **Maintenance plan**
 - **Measurement and verification (M & V)**
- **Maintenance approach includes**
 - **Involving the maintenance staff in technology choices**
 - **Maintenance training for new technologies**

Examples of Utility-Installation Collaboration Between Fort Irwin and SCE

- **UESC projects**
 - Energy Management Control System
 - Thermal Energy Storage
 - HVAC energy efficiency replacement on all modular buildings
- **SCE providing Fort Irwin with**
 - Energy audits
 - Power quality and other training
- **SCE helping private company with “savings by design” in new privatized housing project**
- **Sharing cost of installation REM**
- **Fort Irwin contracting and DPW staff and SCE staff regularly meeting to discuss energy issues on post**
- **SCE owns Fort Irwin electrical distribution system**
- **SCE servicing solar street lighting through USC**

Fort Irwin Solar Powered and Energy Saving Lights



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Other Examples of Utility-Installation Collaboration

- **SCE helping Chino Navy Exchange learn about and install High Velocity Low Speed (HVLS) Fans**
- **Oklahoma Gas and Electric building and operating power plant on Tinker AFB which provides energy security in disaster situation**
- **Balboa Naval Hospital implemented a UESC with San Diego Gas and Electric (SDG&E)**
 - **For a 4.5 megawatt cogeneration plant**
 - **Shared air quality emission credits**
- **Utility acting as technical, legal, and regulatory advisor on Enhanced Use Lease (EUL) renewable energy generation deal at an AFB**
- **Xcel Energy partnership and Western Area Power Administration (WAPA) facilitation help in the Fort Carson 2-MW solar array project**

Installations Can Collaborate with Energy Utilities in Many Ways

- **UESCs to help finance and implement energy efficiency projects**
- **Utility Services Contract (USC)**
 - **Provides utility distribution and transmission systems on the installation**
 - **Can be used by installations to sole source some energy efficiency projects**
- **Utility working closely with installation to ensure reliable service**
- **Working together to reduce installation energy demand/demand response**
- **Utility sells renewable energy or renewable energy credits (RECs)**
- **Utility rebates/incentives programs**
- **Utility providing range of services to the installation**

Southern California Edison (SCE) Educational Resource Center



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Report at: <http://www.rand.org/pubs/monographs/MG1126.html>

Other Services Provided by Some Utilities

- **Energy audits**
- **Energy efficiency and technology training and education**
- **Technical assistance for reviewing, choosing, installing and/or operating**
 - **Energy efficient technologies, including ESPC advice**
 - **Renewable energy technologies**
- **Helping to pay for energy staff**
- **Helping with energy security**
- **Helping with on-site renewable energy generation deals**
- **Legal, regulatory, and financial advice**

Benefits for Military Installations from Collaborating with Utilities

- **Saving money and decreased energy consumption**
- **Increased investments in**
 - **Energy efficiency activities**
 - **Renewable energy technologies**
- **Improve installation operations and building performance**
- **Improve energy security**
- **Receive technical assistance and information**
- **Provide benefits to other energy efficiency activities**
- **Installations can do things that they could not do on their own**
- **Develop long-term collaborative partnerships for mutual benefits**

Benefits for Utilities from Collaborating with Installations

- **Make a profit and help the bottom line**
- **Help avoid having to build new power plants**
- **Help meet energy consumption reduction goals**
- **More easily build a new power plant on a military installation**
- **Help meet energy security goals**
- **Help meet renewable energy requirements and goals**
- **Help advance smart grid and other future goals**
- **Public image and community relationship benefits**
- **Develop long-term collaborative partnerships for mutual benefits**

Outline

- **How installations collaborate with utilities**
 - Installation examples
 - Summary of the collaboration methods and benefits
- **Findings and recommendations**
 - Barriers to installations collaborating with utilities
 - Recommendations about how best to overcome the barriers

Barriers to Installations Implementing UESCs and Collaborating with Utilities

- **Some utility companies not interested in participating**
- **Installation energy staff issues**
- **Legal and contracting staff issues**
- **Other installation support issues**
- **Renewable energy investment issues**
- **Other issues**

Why Some Utilities Choose Not to Collaborate with Army Installations

- **Some utilities have no interest or motivation to save energy**
- **Some lack incentive programs**
- **Some do not have knowledge or enough technical expertise**
- **Not enough staff time**
- **Do not like 10 year payback in UESCs**
- **Perception of too much federal “red tape”**
- **Some fear federal process being too slow and risky**

Recommendations to Motivate More Utilities to Collaborate with Army Installations

- **Promote more direct outreach and collaboration with utilities**
 - Have an Army policy that requires installations to reach out to utilities about collaboration for mutual benefit
 - Engage more at a HQ-level with utility associations
 - Where needed, encourage a utility that is working successfully with an installation to talk with a reluctant utility
- **Provide more education to utilities**
 - Request that FEMP educate utilities about advantages to them
 - Request that PNNL conduct technical discussions with them
 - Create a briefing on advantages to the utilities from doing a UESC with Army installations
- **Allow at least a 30 year payback in UESCs**
- **Speed the federal process where can, such as addressing other barriers that slow the process**

UESC Legal and Contracting Staff Issues

- **Lack of knowledge and understanding about UESCs**
 - **Some think UESCs are not legal**
 - **Not enough visibility or information about UESCs**
- **Lack of staff time**
- **Insufficient technical expertise**
- **Reluctance to make long term commitments**
- **Complexities of developing and implementing a UESC**
- >These issues can delay UESC contracts for months or years**

Education Needed to Overcome Legal and Contracting Staff Issues

- **Provide legal training regarding UESCs within standard Army legal educational venues**
 - **JAG school**
 - **In annual environmental course**
 - **As part of contracting legal courses**
 - **At Government Contract Law Symposium**
- **Provide UESC training directly to installation staff**
 - **Request that legal contracting staff attend UESC workshops**
 - **Make sure installation contracting staff get the new UESC policy and the proposed UESC handbook**
 - **FEMP developed contractor training, have Army contractors attend it**
- **Assist reluctant and overworked contracting staff**
 - **Have Center of Expertise within Army HQ contracting office on UESCs**
 - **Refer installation contracting staff to other installation contracting staff with UESC experiences**
 - **Where appropriate, refer to ACSIM/IMCOM or PNNL to provide technical assistance**

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Renewable Energy Investment Issues

- **Renewable energy barriers**
 - Economic issues, such as low utility rates
 - Often uncertainty and risk associated with the technologies
 - Availability and reliability of the resources
- **Renewable energy collaboration barriers**
 - 10 year payback often limits renewable energy collaboration in a UESC
 - Some utilities less likely to want to invest in less proven technologies
- **Renewable energy opportunities for collaboration**
 - Utilities wanting to do on-site power generation/EUL
 - Energy security
 - State and local incentive programs and mandates
 - The new federal emphasis for increased investments in renewable energy technologies

Recommendations for Renewable Energy

- **Encourage, support, and document more renewable energy experiments at installations**
- **Expand Army installation staff education and training**
 - **Fund more conferences/workshops**
 - **Provide detailed “how to” case studies**
- **Should allow 30 year payback in UESCs**
- **Facilitate more networking**
- **In Army policies and guidance, should help improve collaboration with utilities in renewable energy by**
 - **Encouraging more on-site power generation/EUL deals**
 - **Encouraging more energy security collaboration**
 - **Stating that installations should take advantage of state and local incentive programs where they can even if only initial pilot experiments**

Broader Collaboration Issues that are Not UESC Specific

- **Lack of knowledge about or interest in non-UESC collaboration mechanisms**
 - EUL
 - Utility Services Contracts
- **Not much activity in other collaboration opportunities that could be done with or without a UESC**
 - On-site power generation
 - Energy security
 - Metering and smart grid
 - Demand response and other incentive programs
- **Opportunities in these areas that are not being taken advantage of enough**

Recommendations for Broader Collaboration Issues that are Not UESC Specific

- **Provide information and training on non-UESC collaboration mechanisms to installation staff through**
 - Conferences, classes, and documented case studies
 - More emphasis on these non-UESC mechanisms
- **Increase information exchange and collaboration with utilities and utility associations**
- **Take more advantage of utility interest in keys areas**
 - On-site power generation
 - Energy security
 - Metering and smart grid
 - Demand response and other incentive programs
- **Provide more information and training on such opportunities in these key areas**
- **Ensure that installations can use incentives for energy program investments**

Highest Priority Recommendations

- **Need full time trained energy manager at each installation**
- **Provide Army UESC policy and handbook**
- **Expand installation staff UESC education and training**
 - **Help diverse staff attend UESC, FUPWG, GovEnergy, and other relevant energy workshops and meetings**
 - **Provide more staff training**
 - **Document successes with “how to” case studies**
- **Provide more technical assistance to installations and utilities**
 - **About UESCs**
 - **Other collaboration options, including**
 - **Demand response**
 - **Renewable energies**
 - **USCs**
- **Allow at least 30 year payback in UESCs**

Conclusions

- **Army installations have already demonstrated that there are many benefits from collaborating with utilities, including**
 - **Saving money and energy use**
 - **Increasing energy reliability and security**
 - **Establishing a long-term working relationship for mutual benefit**
- **More Army installation and utility collaborations would help meet current and future national and Army goals in**
 - **Energy conservation**
 - **Renewable energy investments**
 - **Energy security**
 - **Cost effectiveness**
- **Army should place more emphasis on UESCs and other utility collaboration opportunities**
- **Key barriers should be eliminated to increase such collaborations, including**
 - **Providing installations with full time trained energy managers**
 - **Allowing 30 year payback in UESCs**
 - **Providing education, training, and technical assistance about collaboration mechanisms**